

Notice of Allowability

Application No.

10/816,504

Examiner

Sylvia R. MacArthur

Applicant(s)

BOYD ET AL.

Art Unit

1763

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to the amendment/remarks sent 12/22/2006.
2. ☒ The allowed claim(s) is/are 7-14 and 16-24.
3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 - a) ☐ All b) ☐ Some* c) ☐ None of the:
 1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
 5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
 - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
 - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
 - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☒ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application
6. ☒ Interview Summary (PTO-413), Paper No./Mail Date _____.
7. ☒ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☒ Other page 1 of specification.

DETAILED ACTION

EXAMINER'S AMENDMENT

1. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

The application has been amended as follows:

Specification

2. On page 1 lines 7-10, the serial numbers (10/816,417 and 10/816,418) of the related applications were inserted; see attached copy of page 1 of specification.

Claims

Claim 16 now reads--

16. (Currently Amended) The pre-planarization module of claim 14 ~~15~~, wherein the fluid is magnetorheological fluid.

Reasons for Allowance

3. The following is an examiner's statement of reasons for allowance:

Boyd et al (US 7,108,591; note this co-pending application has an effective date that is the same as the present invention) claims a semiconductor substrate support wherein the chuck has an electromagnetic field causing the chuck to change from a compliant state to a rigid state. The *claims* of Body et al fail to claim or fairly suggest an annular ring and/or a second layer disposed over a first layer, the second layer including an abrasive component configured to grind a substrate as recited in claim 7 of present invention. Likewise, the prior art of Boyd et al fails to

Art Unit: 1763

claim the combination of an annular ring having a compliant layer and a side of the compliant layer that is affixed to a planarizing surface.

Elledge (US 2004/0214514) teaches a polishing (grinding) device 110 comprising an under pad 150 (first layer) that dynamically modulates its compressibility (changes from compliant to rigid state) see [0024] due to the presence of magnetorheological fluid 160, polishing pad 140 (second layer including abrasives) is disposed over the first layer. The first and second layer fail to be disposed over the surface an annular ring as recited in claim 7 of the present invention. Likewise, the prior art of Elledge fails to teach the combination of an annular ring having a compliant layer and a side of the compliant layer that is affixed to a planarizing surface.

Thus, the prior art of record fails to teach or fairly suggest a grinding device comprising an annular ring, a first layer disposed over a surface of the annular ring; the first layer configured to alternate between a compliant state and a rigid; and a second layer disposed over the first layer, the second layer including an abrasive component configured to grind a surface of a substrate as recited in claim 7 of the present invention. Likewise, the prior art of record fails to teach or fairly suggest a pre-planarization module configured to perform a long range planarization operation, comprising an annular ring having a compliant layer and a side of the compliant layer that is affixed to a planarizing surface as recited in claim 16 of the present invention.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue

Art Unit: 1763

fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."


4. Claims 7-14 and 16-24 are allowed.

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sylvia R. MacArthur whose telephone number is 571-272-1438.

The examiner can normally be reached on M-F during the hours of 8:30 a.m. and 5 p.m.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Parviz Hassanzadeh can be reached on 571-272-1435. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.


Sylvia R MacArthur
Patent Examiner
Art Unit 1763

March 16, 2007

COMPLIANT GRINDING WHEEL

by Inventors

John M. Boyd, Fred C. Redeker, and Yezdi Dordi

5

CROSS REFERENCE TO RELATED APPLICATION

This application is related to U.S. Patent Application No. 10/816,417 (Attorney

Examiner's
in Amett

Docket No. LAM2P469) filed on the same day as the instant application and entitled

"PRE-PLANARIZATION SYSTEM AND METHOD," and U.S. Patent Application No.

3/16/07

- 10 10/816,418 (Attorney Docket No. LAM2P471) filed on the same day as the instant application and entitled "COMPLIANT WAFER CHUCK." The disclosure of these related applications are incorporated herein by reference in their entirety for all purposes.

BACKGROUND OF THE INVENTION

15 1. Field of the Invention

[0001] The present invention relates generally to semiconductor manufacturing and, more particularly, to a method and apparatus for pre-planarizing a substrate in order to more efficiently perform a planarization operation.

2. Description of the Related Art

- 20 [0002] During copper interconnect manufacturing, a copper layer is deposited on a seed/barrier layer using an electroplating process. Components in the electroplating solution provide for appropriate gap fill on sub-micron features. However, these sub-micron features tend to plate faster than the bulk areas and larger, i.e., greater than 1 μm , trench regions. The sub-micron regions are typically found in large memory arrays such
- 25 as, for example static random access memory (SRAM), and can comprise large areas of